

CLAIMS

1. Automatic method for learning frequent chronicles in an alarm log, the alarms being associated
5 with a plurality of events with a plurality of types, characterised in that it comprises the following steps:

a) automatic selection and grouping of alarm sequences in the alarm log so as to form groups of similar alarm sequences; and

10 b) automatic generation of a partial alarm log for each group of similar alarm sequences obtained in step a), starting from alarms belonging to sequences of this group; and

c) automatic learning of frequent
15 chronicles in each partial alarm log obtained in step b) so as to generate a partial set of frequent chronicles ~~for each partial alarm log obtained in step b)~~, and production of a set of frequent chronicles in the alarm log starting from frequent chronicles in each
20 of the partial sets of frequent chronicles obtained.

2. Method according to claim 1 in which alarm sequences are automatically selected by automatic breakdown of the alarm log into parts in step a), each
25 part being formed of alarms in the alarm log for which the occurrence dates are ordered in time and are included between a start date and end date associated with this part of the log, each part of the alarm log defining a selected alarm sequence for which the alarms
30 belong to this part.

3. Method according to claim 2 in which the breakdown of the alarm log into parts is such that any alarm in the alarm log belongs to at least one of the parts of the alarm log.

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4. Method according to any one of claims 1 to 3, in which automatic grouping of alarm sequences is made in step a), using a grouping method to form groups of similar alarm sequences.

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5. Method according to any one of claims 1 to 4 in which the groups of similar alarm sequences are formed in step a), by the following steps consisting of:

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- representing each of the alarm sequences in the alarm log by its content, based on a set of alarm types with A elements taken from among distinct alarm types in the alarm log, with a number greater than or equal to A , in an alarm sequence representation space with dimension A ; and

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- automatically grouping alarm sequences in the alarm log and in the alarm sequence representation space, so as to form groups of similar alarm sequences.

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6. Method according to claim 5 in which each alarm sequence selected in step a) is represented in the representation space with dimension A , by a point with A coordinates, the coordinate with rank j where j is any integer index between 1 and A , is equal to the number of times that the alarm type associated with index j appears in the alarm sequence.

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7. Method according to any one of claims 1 to 4 in which groups of similar alarm sequences are formed in step a) following the steps consisting of:

- 5 - automatically grouping alarm types in the alarm log so as to form groups of similar alarm types, the result of grouping being a number S of groups of alarm types; and
- 10 - representing each alarm sequence in the alarm log by its content based on S' groups of alarm types obtained in the previous step, where the number S' is less than or equal to S , in an alarm sequence representation space with dimension S' ; and
- 15 - automatically grouping alarm sequences in the alarm log in the alarm sequence representation space, so as to form groups of similar alarm sequences.

8. Method according to any one of claims 1 to 3 in which the groups of similar alarm sequences formed in step a) are formed using the following steps consisting of:

- 20 - automatically grouping alarm types in the alarm log so as to form groups of similar alarm types, the result of grouping being a number S of groups of alarm types; and
- 25 - representing each alarm sequence in the alarm log by its content based on S' groups of alarm types, where the number S' is less than or equal to S obtained in the previous step, in an alarm sequence representation space with dimension S' ; and
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- automatically forming groups of similar sequences in the alarm log, each group of similar sequences being associated with a group of alarm types and resulting from the selection of alarm sequences in the alarm log for which the content of alarms of the same type in the group of types considered exceeds a given threshold for this group.

9. Method according to either of claims 7 or 8 in which the automatic grouping of alarm types in step a) to form groups of similar alarm types, is made using a grouping method.

10. Method according to claim 9 in which automatic grouping of similar alarm types in the alarm log in step a), is made using a grouping method based on a semantic map of alarm types.

11. Method according to claim 9 in which automatic grouping of similar alarm types in the alarm log in step a) is made using a grouping method based on the accumulation profile for each alarm type in time, in the alarm log.

12. Method according to any one of claims 1 to 11, in which learning on partial alarm logs obtained in step b) is made in series, in step c).

13. Method according to any one of claims 1 to 11 in which learning on partial alarm logs obtained in step b) is made in parallel, in step c).

14. Method according to claims 3 and 4 in which:

- 5 - a maximum duration T of chronicles to be learned in step c) is fixed; and,
- in step a), the difference between the end date and the start date of any part of the alarm log is equal to $2 \cdot T$; and,
the parts are broken down in the alarm log such that
10 for any given part with start date D' , the part for which the subsequent start date D'' is closest to D' , if it exists, is such that its start date D'' is equal to the date D' plus T ; and,
the alarm sequences obtained in the alarm log are
15 grouped automatically using an algorithm based on Kohonen self-organising maps; and
- in step b), a partial alarm log is produced for each group of similar alarm sequences obtained in step a), from the union of alarm sequences
20 in the group of similar alarm sequences; and
- in step c), the FACE learning system is used for automatically learning the chronicles.

15. System for automatic learning of
25 frequent chronicles in an alarm log comprising means of acquisition of alarms and generation of an alarm log starting from acquired alarms, each alarm being associated with one event from among a plurality of types and an occurrence date, means of transmission of
30 the alarm log and chronicle learning means capable of using an automatic method for learning frequent

chronicles in an alarm log, with frequencies greater than or equal to an adjustable minimum frequency threshold f_0 and an adjustable maximum duration T , and that can transmit the chronicles obtained, characterised in that it also comprises:

5 - an alarm sequence selection and grouping module capable of receiving an alarm log and capable of selecting and grouping sequences of alarms in the alarm log, and capable of forming a group of similar alarm sequences and transmitting this group; and

10 - a module for producing a partial alarm log starting from the alarms of a group of similar alarm sequences received from the module that selects and groups alarm sequences in the alarm log, the module being capable of transmitting the partial alarm log obtained to the chronicle learning means; and

15 - a module for producing a set of frequent chronicles in the alarm log, from chronicles transmitted by chronicle learning means, the module being capable of transmitting chronicles from the set of frequent chronicles.

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